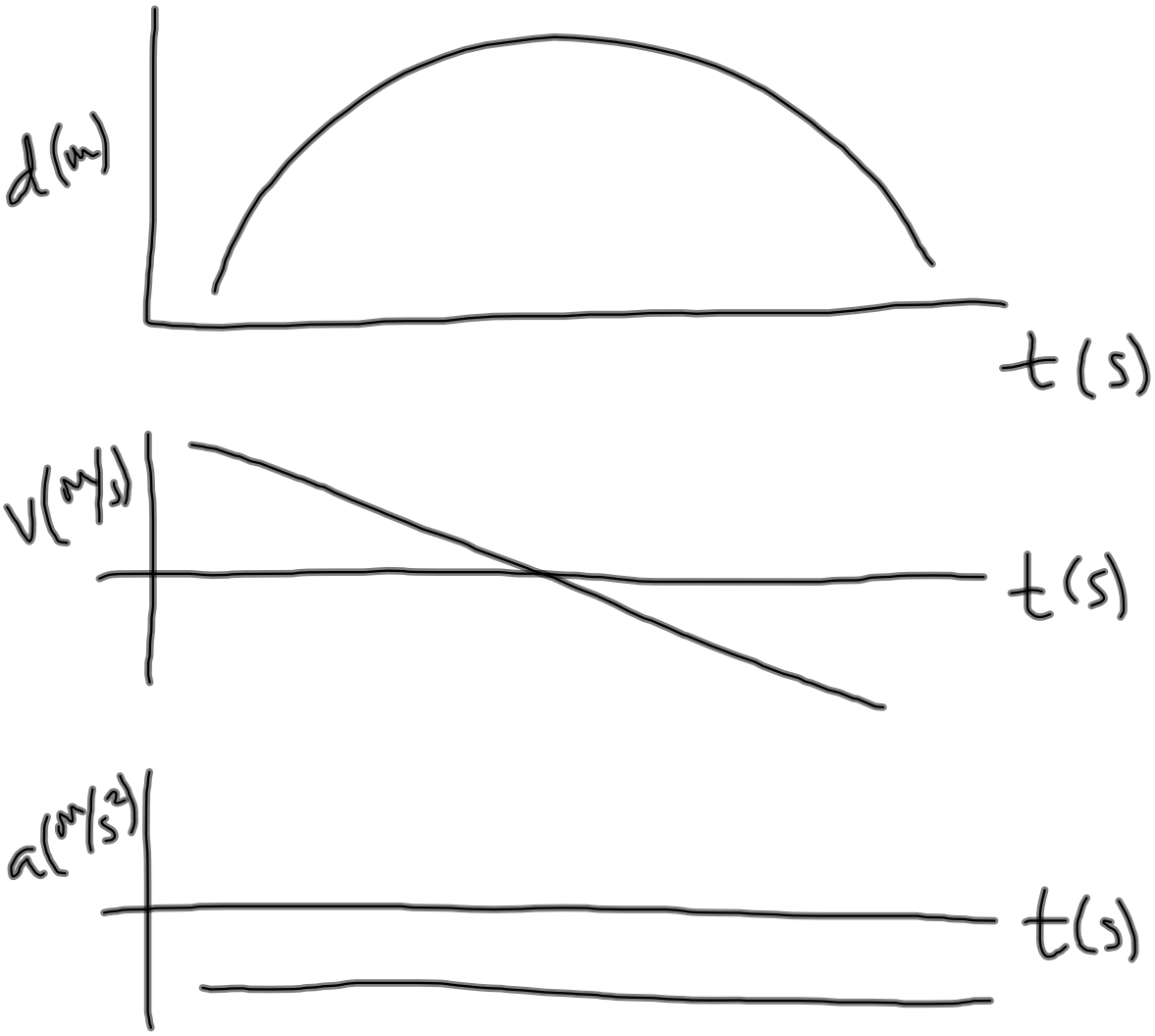
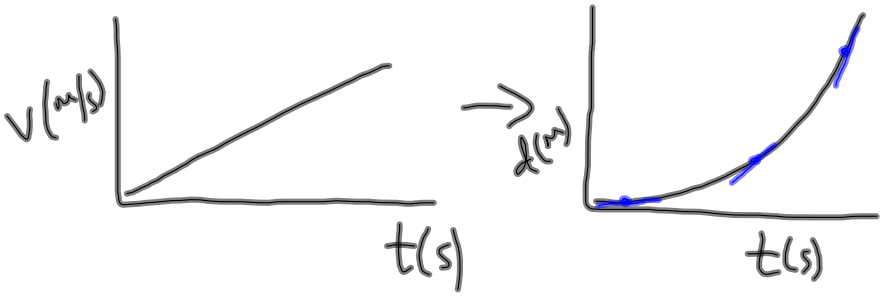
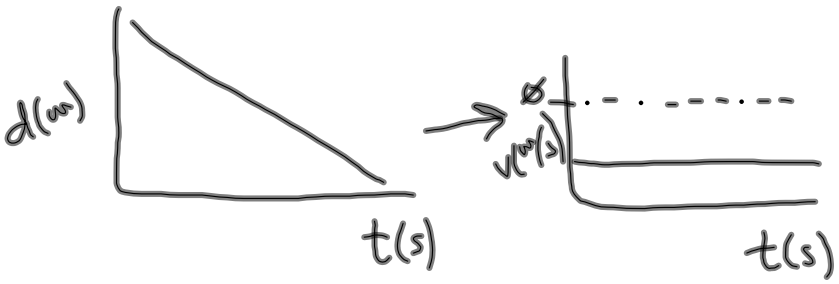
Displacement v. time graph of something going up then down

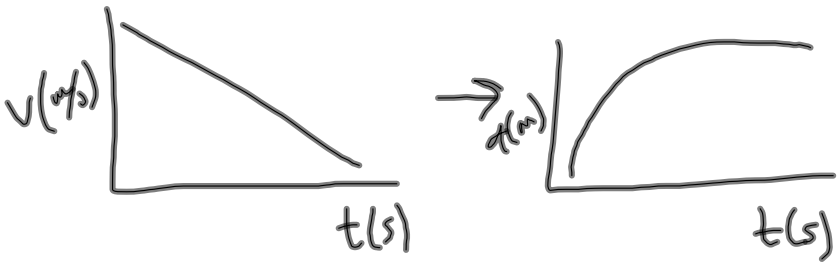


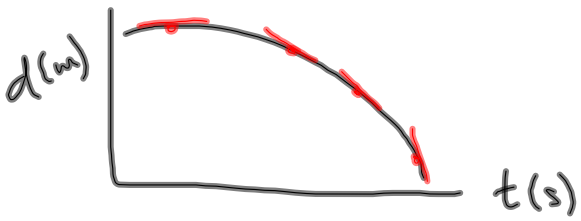
Graphing on test:

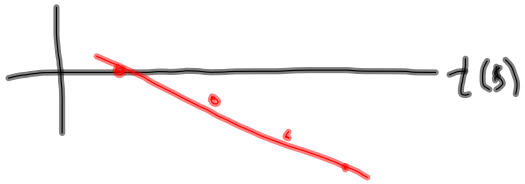
- Given d v. t or v v. t, choose what other looks like











Vectors and Scalars:

Vectors:

- displacement
- velocity
- acceleration

Scalars:

- distance
- speed
- time

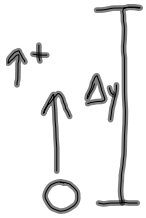
A person throws a ball upwards at 10 m/s.

a) How high does it travel?

b) How long does it take to reach the highest point?

a) ↑+ $V_{iy} = +10\ m/s$ $V_{fy} = 0\ m/s$

$a_g = -9.8\ m/s^2$ $\Delta y = ?$



$V_{fy}^2 = V_{iy}^2 + 2a_g\Delta y$

$\Delta y = \frac{-V_{iy}^2}{2a_g}$

$= \frac{-(10\ m/s)^2}{2(-9.8\ m/s^2)}$

$= 5.1\ m$

b) $t = ?$

$V_{fy} = V_{iy} + a_g t$

$t = \frac{V_{fy} - V_{iy}}{a_g}$

$= \frac{-10\ m/s}{-9.8\ m/s^2}$

$= 1.02\ s$

A person standing on a balcony at 10 m throws a ball upwards at a velocity of 8 m/s.
a) How high does the object go above the 10 m starting point?
b) How long does it take for the ball to hit the ground?

a) ↑+ ↑ O — Δy $\quad v_{iy} = 8\ m/s \quad v_{fy} = 0\ m/s$

$a_g = -9.8\ m/s^2 \quad \Delta y = ?$

$$v_{fy}^2 = v_{iy}^2 + 2a_g\Delta y$$

$$\Delta y = \frac{-v_{iy}^2}{2a_g}$$

$$= \frac{-(8\ m/s)^2}{2(-9.8\ m/s^2)}$$

$$= 3.27\ m$$

b) total time = time to highest point + time to ground

time to highest point: $\quad t = ?$

$v_{iy} = 8\ m/s \quad v_{fy} = 0\ m/s \quad a_g = -9.8\ m/s^2$

$$v_{fy} = v_{iy} + a_g t$$

$$t = \frac{-v_{iy}}{a_g} = \frac{-8\ m/s}{-9.8\ m/s^2} = 0.816\ s$$

time to ground:

$v_{iy} = 0\ m/s$ highest point

$\Delta y = -13.27\ m$

$$\Delta y = v_{iy}t + \frac{1}{2}a_g t^2$$

$$t = \sqrt{\frac{2\Delta y}{a_g}}$$

$$= \sqrt{\frac{2(-13.27\ m)}{-9.8\ m/s^2}}$$

$$= 1.65\ s$$

$$\text{total time} = t_1 + t_2 = 0.816s + 1.65s = 2.466\ s$$

- 0.82 s | 1.65